CLAIMS:

1. A noise suppressing method comprising steps of:

dividing an input light including an signal light and noise light within a signal wavelength band of the signal light into a first component with a first polarization direction parallel to a polarization direction of the signal light and a second component with a polarization direction orthogonal to the polarization direction of the first component and applying the first component to a first arm and the second component to a second arm;

shifting a optical phase of the second component in the second arm so that the optical phase of the second component in the second arm relatively differs by π from the first component in the first arm; and

combining the first component output from the first arm and the second component output from the second arm to make the noise lights included in the first and second components interfere with each other.

2. The method of claim 1 wherein the polarization-dividing step comprises steps of:

detecting the intensity of a base repetition frequency component out of the first component in the first arm; and

adjusting the polarization of the input light so as to increase the intensity of the base repetition frequency component.

3. The method of claim 1 wherein the polarization-dividing step comprises steps of:

extracting a light within the signal wavelength band out of the input light:

detecting the intensity of the base repetition frequency component out of the first component in the first arm; and

adjusting the polarization of the extracted light by the extracting step so as to increase the intensity of the base repetition frequency component.

4. The method of any one of claims 1 through 3 wherein the optical phase shifting step shifts the optical phase of the second component in the second arm according to its wavelength using a spectral delay having a delay amount that differs according to a wavelength.

5. The method of claim 1 further comprising a second polarization-adjusting step to adjust the polarization of the second component in the second arm so as to maximize a SNR of the combined light by the combining step.

6. The method of claim 5 wherein the second polarization-adjusting step extracts the component with the polarization orthogonal to the polarization direction of the signal light included in the combined light out of the combined light by the combining step, and adjusts the polarization of the second component in the second arm so as to maximize the intensity of the extracted component.

7. The method of claim 5 wherein the second polarization-adjusting step measures a degree of polarization of the combined light by the combining step and adjusts the polarization direction of the second component in the second arm so as to maximize the degree of polarization.

8. The method of claim 1 further comprising steps of:

dividing the combined light by the combining step into a third component with a polarization parallel to the polarization direction of the signal light included in the

combined light and a fourth component with a polarization orthogonal to the polarization direction of the third component;

converting each of the third and fourth components into an electric signal;

detecting the intensity of a base repetition frequency component of the signal light out of the electric signal of the third component;

detecting the intensity of a low frequency component out of the electric signal of the fourth component;

controlling the polarization direction of the first component in the first arm so as to maximize the intensity of the base repetition frequency component; and

controlling the polarization direction of the second component in the second arm so as to minimize the intensity of the low frequency component.

9. A noise suppressor comprising:

a polarization divider to divide an input light including a signal light and a noise light within a signal wavelength band of the signal light into a first component with a polarization parallel to a polarization direction of the signal light and a second component with a polarization orthogonal to the polarization direction of the first component and applies the first component to a first arm and the second component to a second arm;

an optical phase shifter disposed in the second arm to shift the optical phase of the second component in the second arm so that the optical phase of the second component in the second arm relatively differs by π from the first component in the first arm; and

a combiner to combine the first component output from the first arm and the second component output from the second

arm to make the noise lights included in the first and second components interfere with each other.

10. The apparatus of claim 9 wherein the polarization divider comprises:

a base repetition frequency component intensity detector to detect the intensity of a base repetition frequency component out of the first component in the first arm; and

a polarization adjuster to adjust the polarization of the input light so as to increase the intensity of the base repetition frequency component.

11. The apparatus of claim 9 wherein the polarization divider comprises:

an optical bandlimit filter to extract a signal wavelength band of the signal light out of the input light;

a base repetition frequency component intensity detector to detect the intensity of a base repetition frequency component out of the first component in the first arm; and

a polarization adjuster to adjust the polarization of the output light from the optical bandlimit filter so as to increase the intensity of the base repetition frequency component.

12. The apparatus of claim 9 wherein the optical phase shifter comprises a spectral delay having a delay amount which differs according to a wavelength, and an optical circulator to apply the second component in the second arm to the spectral delay and to return the output light from the spectral delay into the second arm.

13. The apparatus of claim 9 further comprising a second polarization adjuster to adjust the polarization of the second

component in the second arm so as to maximize a SNR of the combined light from the combiner.

14. The apparatus of claim 12 wherein the second polarization adjuster comprises a polarization controller disposed in the second arm to control the polarization of the second component and a controller to extract a component with a polarization orthogonal to the polarization direction of the signal light included in the combined light out of the combined light from the combiner and to control the polarization controller so as to minimize the optical intensity of the extracted component.

15. The apparatus of claim 12 wherein the second polarization adjuster comprises a polarization controller disposed in the second arm to control the polarization of the second component and a controller to measure a degree of polarization of the combine light from the combiner and to control the polarization controller so as to maximize the degree of polarization.

16. The apparatus of claim 9 further comprising:

a first polarization controller disposed in the first arm to control the polarization of the first component;

a second polarization controller disposed in the second arm to control the polarization of the second component;

a polarization beam splitter to split the combined light from the combiner into a third component with a polarization parallel to the polarization direction of the signal light included in the combined light and a fourth component with a polarization orthogonal to the polarization direction of the third component;

an optoelectric converter to convert each of the third and fourth components into an electric signal;

a bandpass filter to detect the intensity of a base

repetition frequency component of the signal light out of the electric signal of the third component;

a lowpass filter to detect the intensity of a low frequency component out of the electric signal of the fourth component; and

a controller to control the first polarization controller so as to maximize the intensity of the base repetition frequency component and to control the second polarization controller so as to minimize the intensity of the low frequency component.

17. The apparatus of claim 9 further comprising a phase plate disposed either in the first arm or the second arm to rotate polarization.